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INTERNATIONAL COMPARISON PROJECT (ICP)

International Comparison Project (ICP) Developments

Report of the Secretary-General

SUMMARY

The present report describes the results of and main difficulties encountered in the 1975 survey (phase III of the International Comparison Project), updating the results of the survey to subsequent years and the various possibilities for including as many countries as possible in ICP in the future. It also describes the main unsolved methodological problems and the research carried out in various organizations. Empahsis is put on the serious financial and human resources difficulties faced in carrying out ICP. Points for discussion by the Commission are included (para. 96).

* E/CN.3/535.

CONTENTS

		Paragraphs	Page
INTRODUCTION		1 - 2	3
I.	REPORT ON PHASE III	3 - 16	3
	A. Basic methods and regionalization	3 - 10	3
	B. Binary comparisons	11 - 12	6
	C. Multilateral results	13 - 16	6
II.	THE 1979-1984 ROUND: AIM AND METHODOLOGY	17 - 23	7
III.	THE 1979-1984 ROUND: STATUS OF WORK	24 - 72	9
	A. Full-scale survey	24 - 44	9
	1. Problems of special sectors	26 - 30	10
	2. Treatment of market/non-market commodities and of subsidies	31 - 37	11
	3. Aggregation questions	38 - 44	13
	B. Reduced-information survey	45 - 52	15
	C. Short-cut method	53 - 58	16
	D. Regional and subregional comparisons	59 - 64	17
	E. Methods for updating the results	65 - 69	18
	F. Manual for participating countries	70 - 72	19
IV.	TIME SCHEDULE FOR PHASE IV AND WAYS TO ACHIEVE IT	73 - 94	20
	A. Regionalization	73 - 80	20
	B. Organization of phase IV	81 - 85	21
	C. Expert group	86 - 90	22
	D. Trust Fund	91 - 94	22
V.	CONCLUDING REMARKS	95	23
VI.	POINTS FOR DISCUSSION	96	24

INTRODUCTION

1. The Statistical Commission at its twentieth session requested that a progress report on the International Comparison Project (ICP) should be submitted to it at its twenty-first session. 1/

2. Section I of the present report provides information on phase III of ICP, that is, the comparison of 34 countries in 1975. Sections II and III review the main aims of ICP and describe the principal methodologies which are expected to be used to achieve these aims. Section IV outlines the organization of the work in phase IV (1979-1984) and indicates the time-schedule and main requirements to complete the work.

I. REPORT ON PHASE III

A. Basic methods and regionalization

3. The report on ICP for the twentieth session of the Statistical Commission (E/CN.3/513 and Corr.1) presented a review of the basic methodology developed during the first three phases of ICP. The present section will describe some new features of phase III comparisons and briefly describe the main results. The report on the phase III round of comparisons is scheduled to be published at the end of 1980; the first part will present the basic comparisons of real product and purchasing power, while the remainder will present more experimental work.

4. With 34 participating countries in phase III, it was possible to undertake analysis by regions. In the regions with the greatest number of participants, Europe with 15 countries and Asia with 10, there have been meetings of participating countries to attempt to establish a list of items that was characteristic of the region and that would overlap with items priced in the rest of the world. There was also an attempt to introduce regional items into the lists for Africa and Latin America, where there were three and five participating countries, respectively. This emphasis on regional selection of items for price comparison represented an attempt, especially in consumption, to reduce reliance on the United States of America to provide the overlapping of prices with other countries. While this achieved the aim of making the United States role less important in the comparisons, it also had consequences for types of binary comparisons produced in phase III, which are discussed in paragraphs 10-11 below.

5. For each of the 153 categories of the gross domestic product (GDP) used in ICP, a purchasing power parity (PPP) with respect to the numeraire country has been calculated for each country on the basis of the prices provided or in a few categories derived from direct quantity comparisons. In phases I and II, the PPPs were calculated by the country-product-dummy (CPD) method across all the countries at once, taking the United States of America as the numeraire country.

1/ Official Records of the Economic and Social Council, 1979, Supplement No. 3 (E/1979/23), para. 77 (g).

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This method makes it possible to estimate transitive PPP even if all items are not priced in each country. In phase III, CPDs were again calculated both over all 34 countries at once and taking one region at a time, but experiments were also carried out with the method used in Europe, namely the EKS method. 2/ After weighting the alternative, the procedure followed was to apply the CPD method first at the regional level obtaining regional PPPs and prices and then to link the regions by using the CPD method on the prices from the five regions used in phase III.

6. Several changes were introduced for individual categories in phase III. In categories where there was considerable dispersion in price ratios for individual items, item weights were introduced (even though they sometimes had to be roughly approximated) into the CPD estimates. This had already been done in phases I and II and was extended to several additional categories in phase III. In the rents and automobiles categories, a number of new specifications and somewhat simplified procedures for weighting and for binary comparisons were introduced.

7. An extensive examination was made of the treatment of services in phase III and, as indicated below in the discussion of the phase IV plan, this remains an important problem area.

8. In phases I and II, it was assumed that personnel in medical care, education and government, in similar occupations (truck driver, secretary, surveyor etc.) and with similar levels of education would have the same productivity in all countries and that the quantity comparison could, therefore, be derived from a simple salary comparison or, in some cases, more directly from the number of personnel. The equal productivity assumption appears inconsistent with the historical experience of countries where productivity of government workers has risen, inconsistent with the fact that capital per worker is much greater in some countries than in others and of doubtful validity in countries where total government employment has risen very rapidly for political reasons, that is, more than in proportion to the quantity of work to be performed. Experiments were attempted to relate capital per worker into estimates of PPPs for the government employment categories, but too few countries could supply data for the results to provide any guidance. For medical care, it was possible to shift the phase III comparisons to price comparisons based on services rendered and it was also possible to improve greatly the comparison for teachers; however, the equal productivity assumption was substantially retained for teachers and government employees, a decision based on necessity rather than choice. These departures make the phase I and II results, as published, inconsistent with phase III (this problem is discussed below), but the phase III report will provide consistent estimates for a span of years.

2/ The EKS method is named for its three independent discoverers, Eltetö, Koves and Szulz and is described by L. Drechsler, "Weighting of index numbers in international comparisons", Review of Income and Wealth (March 1973), pp. 17-24. The application of the CPD method to regions is discussed in the forthcoming phase III report and in the paper "The role of regionalization in a world wide system of international product comparisons" by I. B. Kravis, A. Heston and R. Summers, published in Proceedings of the Conference on International Comparisons (Rio de Janeiro, January 1979). The regions were Africa, Asia, Europe, Latin America and the United States of America.

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9. The category PPPs obtained mainly by the CPD method and the expenditures formed the input for aggregating the detailed category data to obtain multilateral price and quantity comparisons for GDP and its final expenditure subcomponents. Alternative forms of aggregation, including the methods used by the Statistical Office of the European Communities (EUROSTAT), 3/ were considered along with the method used in phases I and II, that is, the Geary-Khamis method, and the latter was retained as the preferred method for the tables to be presented in the phase III report. As in the reports on phases I and II, the results from the other methods are presented and the differences discussed.

10. In obtaining the multilateral results, experiments were performed with aggregations made first at the regional level, followed by an aggregation across the five regions, using as inputs the expenditures and PPPs from the regions. Even with this two-stage procedure, it is necessary at the end to express each country in terms of the world numeraire currency so that easily accessible comparative data can be offered to users. There are two choices in achieving this end. Regional totals for GDP can be allocated among the countries of each region so as to preserve the cardinal regional ranking of countries at the GDP level or the regional total for each detailed category can be allocated among the countries so as to preserve the regional results at the category level. Of the alternatives, the former was judged preferable in the phase III report. However, still another method was chosen as a compromise between the desirability of producing the best possible intraregional comparisons and the best world-wide comparisons. This has been achieved by using a two-stage CPD and a one-stage Geary-Khamis aggregation. The first-stage CPD was to get PPPs for each detailed category for the countries in the region relative to the regional numeraire country, and the second was to obtain the PPPs for each detailed category for each region in terms of the regional numeraire relative to the world numeraire currency. The numeraire countries are Austria for Europe, Brazil for Latin America, Kenya for Africa, India for Asia and the United States for the world. The quantitative relationships would not have been altered by the selection of other numeraire countries except to the extent that the sample of specifications would have been different. (In each region there was some effort to select specifications that could be found in the numeraire country.) Thus, it is a simple matter to express each country's PPP for each detailed category relative to the world numeraire currency. These PPPs and each country's expenditures in its own currency became the inputs for a universal Geary-Khamis calculation. The rationale underlying the compromise is that substitutions to meet local supply situations and local preferences are more extensive at the detailed category level than at the summary category level. For example, the United Kingdom and Japan (countries at roughly the same income level), will define more with respect to which non-alcoholic beverages (tea or coffee) are favoured than they will in the relative importance of non-alcoholic beverage spending relative to spending on clothing, for example. This intuitively appealing generalization received support in the phase II report. 4/

3/ These methods are presented in Comparison in Real Values of the Aggregates of ESA, 1975 (EUROSTAT, 1977). The acronym "ESA" in the title stands for "European System of Accounts".

4/ I. B. Kravis, A. Heston, R. Summers, International Comparisons of Real Product and Purchasing Power (Baltimore and London, Johns Hopkins University Press, 1978), p. 234.

B. Binary comparisons

11. Because the United States played a pivotal role in the phase I and II comparisons and because the binary comparisons had been the traditional method, binary comparisons of each country with the United States were presented in the earlier ICP reports. In phase III, there was much less overlap of items with the United States than earlier, and in addition, countries in each region - Austria, Brazil, Kenya and India - had agreed to price more items in order to assume the roles of numeraire countries for their regions. Thus it is not surprising that the overlap of items priced in pairs of countries that were not from the same region (including comparisons with the United States) was not great enough to justify presenting traditional binary comparisons. Thus a new procedure was developed to make possible an estimation of all possible binary comparisons between each pair of countries that would minimize the impact of this disadvantage. The results are to be presented in the phase III report at the level of GDP and its three principal components.

12. In the above method, all the items that were priced by at least one of the two countries were included in each binary comparison. Where one partner country did not price an item, its price for the item was estimated from the regional CPD for that category. While this means that price relations from other countries in the region may influence the PPPs for some categories, the results from this method, while obviously less satisfactory than binary comparisons in which each pair of two countries agrees on a large, common list, seem preferable to using only the common items of phase III. For many categories it increases by one third to one half the number of items compared. Also, this procedure makes it feasible to consider all possible binary comparisons, which would certainly not be possible when restricting the comparisons to common items only. The treatment of binary comparisons in phase III makes them non-comparable with those in phases I and II; however, as mentioned in paragraph 4 above, there was already non-comparability inherent in the data collection for phase III.

C. Multilateral results

13. With regard to the multilateral comparisons, it seemed desirable and feasible to re-estimate the basic 1970 comparisons for the 16 phase II countries incorporating data revisions, additional data and changes in methods for handling certain categories, and the revised phase II estimates will be included in the phase III report.

14. For the 16 countries having both 1970 and 1975 bench-mark data, it was possible to check the results for consistency by extrapolating the 1970 results to 1975 by the use of national indexes of change in real output and prices between the two periods at as detailed a level of aggregation as possible. When comparisons were made between the 1975 bench-mark data for the 16 countries and the extrapolation of the 1970 results, there were differences of 5 per cent or more for a number of countries. There are several sources of difference, but the two main problems appear to be that the sample of goods compared in both 1970 and 1975 does not accurately reflect the time-to-time price changes for the various countries;

furthermore, as new items are added to the comparisons and old ones deleted, the net effect of the changes may not be neutralized with respect to their contribution to the purchasing power comparison between any pair of countries. The implications of this finding are disturbing and cause problems not only for extrapolating bench-mark results of ICP-type comparisons but also for the use of smaller price samples in future bench-mark studies for reduced-information work (see paras. 45-52 below) and for other types of comparisons such as those relating to living costs for post-adjustment purposes.

15. The results of the multilateral comparisons for 1975, as well as the 1970 estimates for the 16 phase II countries, will be made available to members of the Commission during the session. While the over-all pattern remains the same, namely, that PPPs of currencies of low-income countries are much lower than exchange rates, and the difference decreases as incomes rise, there are some major changes between 1970 and 1975. As might be expected, the depreciation of the United States dollar vis-à-vis the currencies of other industrial countries led to some instances in which PPP was higher than the exchange rate. Further, the addition of several new types of economies greatly enriches the comparisons. For example, Jamaica is the first Caribbean economy included in the comparisons, and its exchange rate deviation index (exchange rate/PPP) is very much lower than other countries at that level of income. This is probably due to factors such as the dependence on imports for many essential goods, the importance of tourism and the movement of workers into and out of Jamaica. The last two factors may set apart a special group of countries, including those in the Caribbean, for which low exchange rate deviation indexes are typical. This would suggest that the low exchange rate deviation index may also apply to other countries of the Caribbean region. These and a number of other relations for other countries will be examined in the report on phase III.

16. The report will also include a description of experimental work on new methodology, including an examination of short-cut methods for extending the phase III results to non-bench-mark countries. Another aspect of this work is the attempt to classify expenditure categories, not only by whether they represent commodities or services, for traded and non-traded goods, but also by the assignment of representative factor intensities from input-output studies to the categories for analytical purposes. In addition, it will treat the development of estimates of output of the phase III countries in constant international currency units, which would in turn imply a type of world price index over time. Finally, similarity of price and quantity patterns and demand relationships will be analysed for the phase III countries.

II. THE 1979-1984 ROUND: AIM AND METHODOLOGY

17. The principal aim of ICP, for the United Nations, is the yearly estimation of real GDP, of the real value of its main components and of the purchasing power parity of currency of all the countries in the world. In addition to this, estimates of real values for the same aggregates will be provided for the main regions and subregions of the world.

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18. One phase IV objective is to test and agree on the necessary methods and to involve all the regional bodies concerned in order to be able by the end of 1984 to complete a round of comparisons that will, with whatever adjustments prove necessary, make fully operational the model of ICP comparisons that has been developed for implementation by the United Nations on a regular basis.

19. The work is planned as follows:

(a) Every five years 5/ (that is, in bench-mark years) (if possible the same year for all countries):

(i) From 70 to 80 countries, representative of all the regions and all the sociological and politico-economic areas of the world, will participate in a full-scale survey; 6/

(ii) Of the remaining countries, as many as possible will participate in a reduced-information survey;

(iii) The main results for countries not participating in either the full-scale or the reduced-information surveys will be estimated by a short-cut method;

(iv) Results obtained for all the countries will be aggregated (regional aggregation) in order to get significant regional and subregional results.

(b) For other years (that is, in non-bench-mark years):

(i) Results for all the countries will be estimated from the outcomes of the bench-mark year by using methods for updating the results;

(ii) Aggregation within regions or subregions will be obtained by using procedures similar to those used for the bench-mark year.

20. With the present financial and human resources available, which will be discussed below, it is clear that the United Nations Statistical Office alone cannot carry out all the research, surveys and related tasks required for the successful completion of phase IV of ICP.

21. The responsibility for current work has begun to be shared with the regional commissions (in particular, the Economic Commission for Europe (ECE) and the Economic Commission for Latin America (ECLA)) and with organizations such as the

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5/ The frequency of five years is used for the time being; experience will show whether it has to be shortened or lengthened.

6/ The ideal would be that all the countries in the world should participate in the full-scale survey, but this is obviously too costly; also, the lack of statistical development of many countries will prevent their participation.

Estudios Conjuntos sobre la Integración Económica Latinoamericana (ECIEL) 7/ in Latin America and the Statistical Office of the European Communities (EUROSTAT). 8/ Of course, the responsibility for the comparisons of countries on a world-wide basis as well as for the co-ordination of the methodology applied in different regions will remain with the United Nations Statistical Office.

22. For the different subjects where research is required to develop new methods, the United Nations Statistical Office has obtained the co-operation of the World Bank, the Inter-American Development Bank, ECIEL, EUROSTAT and the University of Pennsylvania. Co-operation will be sought from other international and national bodies.

23. In section III below, the methodological problems faced during phase IV and the status of the work on the problems will be described, followed by a discussion of the organization of the full-scale and reduced-information bench-mark surveys.

III. THE 1979-1984 ROUND: STATUS OF WORK

A. Full-scale survey

24. The development of a framework and methodology for a full-scale survey has been a principal aim of the first three phases of ICP. This objective has now been achieved, though the extension to approximately 75 countries in phase IV will provide opportunities for further evaluation, especially on the regionalization question.

25. There remain several areas of comparisons which require improvement and further examination of alternative methodologies. First, there are some important sectors where the definition of output poses problems and where one has to turn to input comparisons and also make very rough assumptions about the comparability of the factor productivity. The main sectors concerned are health, education and government services; these will be examined first. The second difficulty encountered in ICP concerns the general question of institutional differences between the countries, even when their politico-economic systems are rather similar. These discrepancies are usually (but not always) characterized by the differences in financing of the expenditures and by the more or less important intervention of the Government and the local authorities. In some cases, the System of National Accounts (SNA) 9/ concepts are not suitable for the implementation of ICP and some modifications to SNA rules have to be made. In

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7/ Starting in 1980, the current work responsibility in Latin America is being transferred from ECIEL to ECLA.

8/ The United Nations Statistical Office has received very strong financial and human resources support from EUROSTAT, which has agreed to co-ordinate and take responsibility for seven African countries and to organize a meeting of all participating African countries.

9/ *A System of National Accounts* (United Nations publication, Sales No. E.69.XVII.3).

previous ICP work, this was done for special cases such as health expenditures, where most government expenses were added to household consumption; and rents, where government subsidies were added to GDP calculated under SNA rules. It seems that the questions relating to institutional differences should now be extended to other sectors. Some proposals are presented here for market/non-market commodities and for some subsidized services, but the United Nations Statistical Office is aware of their limitations. It must be kept in mind that the main impact of the institutional differences remains where individual price or quantity ratios have to be aggregated to obtain more general ratios, that is, when a relative "importance" has to be applied to each individual category. Aggregation also poses a certain number of other problems regarding missing prices and their estimation, the weighting or not of items and the method to be used for official publications. These topics are examined below.

1. Problems of special sectors

26. Medical services and education and some other services for welfare, leisure and recreation have in common that their output cannot be measured with the same accuracy as for other services, such as shoe repair or laundry. However, each of these services can be said to benefit each recipient individually (in contrast to government services which are applied to the whole collectively). For the time being, the comparisons between countries can only be made by using very rough assumptions of the comparability of outputs: an appendectomy is an appendectomy, regardless of whether the hospital where it has been performed has supplementary facilities (for example, an intensive care unit) which would be available to a patient if required.

27. In many other cases (especially for education), the output in terms of the ultimate outcome (learning) is not easily expressed in quantitative units that clearly represent value added by the activity. Thus, the customary way to solve the problem is to compare inputs. This relies also on very strong assumptions about the comparability of the productivity of labour and capital. As mentioned in paragraph 7 above, a comprehensive examination of this subject was included in the report on phase III; however, the procedure adopted there remains highly unsatisfactory. Other organizations (for example, EUROSTAT, the Hungarian Central Statistical Office) have attempted to solve the problem, but they have dealt with comparisons either within a country or between countries where the level of productivity can be said to be more or less comparable. This experience cannot, therefore, simply be transferred to a world-wide study or to a regional study, where the levels of development of countries are disparate.

28. This problem is very important because it concerns 10-20 per cent of the total expenditures on GDP. For the time being, the United Nations Statistical Office is trying to gather as many qualitative and quantitative data as possible on the medical and educational system in each participating country through a special questionnaire. Various approaches to the problem will be discussed at the expert group meeting proposed by the Statistical Commission 10/ and some solutions adopted at the end of ~~the~~ 1983 before the final processing of phase IV.

10/ Official Records of the Economic and Social Council, 1979, Supplement No. 3 (E/1979/23), para. 77 (d).

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29. Government services raise the same kinds of problems as education and health. But, as stated above, government services are provided to the collectivity rather than to individual recipients and there is no clear measure of output or price. It seems then that these services must be compared only through inputs. Comparing inputs in government services is much more difficult than in other fields because government services are much more linked to the past history of the public service (traditions, investments etc.). Also, the quality and availability of data on the distribution (quantitative or monetary) of these inputs are not always satisfactory, especially in the important field of defence. Finally, in some countries, the Government may perform some functions which, in other countries, are carried out by enterprises. A futher review of this sector is needed and planned. In the questionnaire on expenditures, as a first step, countries have been asked to distinguish expenditures on persons in the armed forces from those on general governmental administration. Countries have also been asked the number of persons in government employment, as well as salaries for specified jobs.

30. In the field of construction, during the first three phases, participating countries priced typical buildings and civil engineering projects in conformity with broad definitions provided by ICP. United States prices were used to match most of the construction cost estimates in all the participating countries. On the other hand, ECIEL (in Latin America) and EUROSTAT (in Europe) have developed methods based on obtaining the total construction cost of building by pricing elements or components (walls, excavations, bathrooms, etc.). This way of dealing with construction has several advantages: the pricing is easier and the matching of qualities may be done without great reliance on the figures of a specified country. A similar procedure is being adopted in ICP and will be applied on a regional basis; interregional matchings are easily made by using, when needed, "international" types of structures or projects which are usually found everywhere. However, for some countries the previous method will still be used.

2. Treatment of market/non-market commodities and of subsidies

31. Market/non-market goods and services are those whose expenses are shared among Government, non-profit institutions serving households and households, the share of any one agent varying between 0 to 100 per cent depending on the country. Differences of this kind between countries may have an impact on GDP itself and its major subcomponents, as well as on the methods of computation of the PPPs for certain commodity groups and on the aggregation of the latter to obtain the PPP for broader categories. Certain steps need, therefore, to be taken to improve the comparability of the data from this point of view. Some specific problems are discussed below.

32. Grants from Government to producers may be dealt with in different ways in national accounts. In broad terms, one may consider: 11/

11/ See A System of National Accounts (United Nations publication, Sales No. E.69.XVII.3), paras. 7.34-7.37.

(a) Grants given to a seller to allow him to charge reduced prices to certain categories of households or persons; SNA calls for recording the full price to all buyers and the total grants are considered as a transfer from the Government to households;

(b) Grants given to a seller to allow him to provide goods and services under cost price to all buyers; the actual expenditure is recorded in the buyer account and the grants as a subsidy to the seller.

For example, if a railway transport service charges lower prices to families with more than three children and the Government reimburses the difference between the reduced price and the actual price to the enterprise, in national accounts, the price charged a large family is the full price and the reimbursement by Government is considered as a transfer to households. On the other hand, if the Government asks the railroad to sell tickets to all travellers at less than the cost price and balances the budget of this society by a subsidy, then the actual price is charged to the travellers in household consumption and the subsidy is a transfer from Government to enterprise which is not counted in GDP.

33. Typical of market/non-market goods and services are pharmaceutical products, medical services, some leisure and recreation services, etc. Typical of subsidized goods and services are rents, public transport and also, in some countries, pharmaceutical products.

34. Since government intervention and social legislation vary from one country to another, in order to establish a firm basis of comparison it is necessary to aggregate the expenses of the different final buyers (who do not purchase for resale) on the same item. This has already been done in ICP in connexion with market/non-market goods and services and the totality of the item has been classified in "final consumption expenditure of the population" (CEP). (The main items are medical care, education, some welfare services and some leisure and recreation services.) Regarding the subsidized goods and services, the only subsidies which should be added to GDP are those required to offset the potential deficit for the entity providing the housing or the services. The result of this procedure is that the value of GDP taken into account in ICP stands, in most countries, at a higher level than the one recorded in SNA. Up to now, ICP has applied this only to rents but there are also other important items such as public transport to which it should also be applied.

35. In phase III, two sets of results will be published, one using "social costs", as suggested above, and one using "actual prices and expenditures". It is intended to re-examine this possibility in phase IV and to examine the possibility of dealing with indirect taxes, which are the negative counterpart of subsidies.

36. There still remains the problem of obtaining the price of specified articles for market/non-market commodities and for subsidized goods and services:

(a) when there is a market price paid by households and another price (or a "cost price") paid by Government;

(b) when the subsidy to balance losses has to be applied to an individual item.

This has already been discussed in part for medical care and some other services and, as indicated in paragraphs 26-29 above, sometimes comparisons of inputs, though unsatisfactory, may be used.

37. These problems as well as the evaluation of the need for subsidies (and indirect taxes) and, more generally, the problems of institutional differences are topics for discussion by the expert group proposed by the Commission.

3. Aggregation questions

38. Regarding aggregation of data, three methodological problems have been examined: (a) estimation of category PPPs when some prices are missing in some countries; (b) aggregation at the category level; (c) aggregation of the categories.

39. During the first three phases of ICP, countries were asked to choose from an extensive list a sample of items in each category that were important in their country and if there were not enough items, countries might suggest additions. No special effort was made to ensure that all countries priced every item in a category. In order to estimate category PPPs, prices were linked across countries by the CPD method. It seemed that a special effort should be made to use more "natural" methods based on less restrictive assumptions than CPD. The procedure being used to "fill the holes" in the price matrix for each item is the following:

(a) After having collected the average prices for all the countries in a given region, a check for missing prices in the participating countries is made;

(b) Countries are asked whether they can provide estimates of the missing prices; some empirical methods, more or less sophisticated, ranging from regression of price to physical characteristics to personal estimates are suggested in a special instruction;

(c) If there are still missing prices after the use of this procedure, some checks by ICP staff with very similar countries (as, for example, Belgium, Germany, Federal Republic of and France for Luxembourg) are used to estimate price differentials with priced commodities and to apply them to the country where the prices are missing;

(d) If there still remain "holes" in the price matrix, these are filled by applying a regional CPD, which is preferable to a world-wide CPD;

(e) For the world-wide study, the missing prices for all the countries in a region are obtained by using a world-wide CPD.

40. The CPD method itself is now being reviewed. The basic underlying assumption is that the price of an item in a given country is the product of two factors, one depending on the country and the other depending on the item. The present ICP practice is to translate this assumption to a linear regression in which the logarithm of item price is the dependent variable. A less strong application would

be to say that, in the space of products, the vectors representing the countries (components are the item prices) are "as close as possible" to the colinearity, which implies that the missing components (or missing prices) are estimated in order to get this closest colinearity. The latter procedure, however, presents some mathematical difficulties which must still be solved.

41. During the first three ICP phases, the aggregation within categories has been done by using a geometric average of the price ratios on the basis of a "numeraire country". Usually the ratios were not weighted. The report on phase I discussed this topic in some detail. 12/ However, in some cases, where dispersion of price ratios was large and where the distribution of expenditures was very different from country to country, a weighted geometric average was used with the same "average pattern of expenditures" assigned to all countries. Though the rationale advanced for this treatment remains very convincing, it would also seem interesting to work in a more "classical" way by allocating the detailed category weights to the individual items priced in the category. For this purpose, it will be necessary to ask the countries to complete a special questionnaire, to provide these breakdowns of expenditure within detailed categories even where only very rough estimates can be brought to bear. It is intended to use these data for a special "test computation", the procedure used in the first three phases still being retained in the main computation.

42. In this "test computation" when the expenditure pattern differs from one country to another, the properties of reversibility and transitivity are lost in binary comparisons in the sense that the result of comparisons of country A to base country B is not the reciprocal of comparison of country B to base country A. Presently, the following procedures are being considered:

(a) CPD will be used only to estimate missing prices;

(b) Two submethods will be applied to obtain all binary comparisons with each country being treated subsequently as a base country: a method with weighted geometric average and another with weighted arithmetic average;

(c) EKS will be applied to all binary results to obtain, at the category level, transitive PPPs which will be used to aggregate between categories.

43. Aggregation of the categories for multilateral comparisons has been carried out by the Geary-Khamis formula in ICP. Although other formulae have been used by other agencies (including the Walsh formula by ECIEL 13/ and a geometric mean formula in which each country is given equal weighting (Gerardi formula) by

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12/ See I. B. Kravis, Z. Kenessey, A. Heston and R. Summers, A System of International Comparisons of Gross Product and Purchasing Power (Baltimore and London, Johns Hopkins University Press, 1975), pp. 47 and 48.

13/ See study by Jorge Salazar-Carrillo, Prices and Purchasing Power Parities in Latin America 1960-1972: an ECIEL Study (Organization of American States, Washington, D.C., 1978).

EUROSTAT 14/), the over-all real GDP per capita produced by the formulae does not vary greatly. The Geary-Khamis formula has the advantage of seeming to lend itself to the calculation of total products for countries, regions and the world in a way that is consistent with national accounts practices for computing national average prices. From the point of view of many participants in ICP, the aggregation formula is a marginal problem in the consideration of the accurate measure of PPPs for health, education, non-market products etc. However, all now agree that a unique formula needs to be used for the publication of official results. This problem will eventually be presented to the expert group proposed by the Commission. In any event, the practice of presenting the main results and analyses on the basis of the Geary-Khamis formula will be continued until further decisions are made but, as in previous ICP reports, the principal results obtained by using other formulae will also be presented.

44. The report on phase III will include binary comparisons for all countries. These comparisons have been made by using all items priced in at least one of the two countries. Whenever an item was priced in one country and not in the other, the missing price was estimated by using, if possible, a regional CPD or, if not possible, a world-wide CPD. This method is an improvement, within multilateral work, on traditional binary comparisons. In fact, the best approach for two countries in a binary comparison is to establish a common representative list of items which can be priced in both countries. This condition cannot be easily met in the multilateral approach and would soon become burdensome for any country which undertook to construct separate common lists for each of its neighbours and trading partners. However, the regionalization of ICP will help to improve binary comparisons when applied in the same way as in phase III.

B. Reduced-information survey

45. As indicated in paragraph 19 above, ideally full-scale comparisons should be available for all countries in the world. Such a set of comparisons will not be available for a long time to come. First, the cost of such an operation is unlikely to be met by the international community, and secondly, the level of development of statistics in some countries would necessitate a great deal of additional work to permit participation in the full-scale survey.

46. For these reasons, research was begun in order to develop methods for obtaining reasonably reliable figures for at least the GDP aggregate as a whole from a survey pricing fewer items and with a less detailed breakdown of expenditures.

47. The World Bank is responsible for the direction and financing of this work, with the help of other organizations such as EUROSTAT.

14/ See Comparison in Real Values of the Aggregates of ESA, 1975 (EUROSTAT, 1977).

48. An important cost-saving aspect of the reduced-information method is that it utilizes as many readily available data on prices and expenditures as possible.

49. For the time being, since the methodology stands at a preliminary stage, it is intended to have the field work (actually the research using existing data and some limited extra surveys) done by persons sent especially for this purpose to the various countries. It is hoped that when the methodology is established it will be feasible to provide detailed instructions to the countries so that they will be able to collect the data themselves.

50. At present, two methods are being reviewed. They are not necessarily mutually exclusive (except in processing) and could eventually be used together to produce two estimates which could be compared.

51. The first method, which may be referred to as the "subsampling method", is rather common in sample surveys: the 150 or so detailed categories of the full-scale survey are aggregated into no more than 40 summary categories over which expenditures on GDP have been distributed. To represent these categories, a sample of about 100 items will be chosen. In the selection process, preference will be given to items (a) that tend to be important in the expenditure in the various categories; (b) that are most frequently priced in the country for use in its time-to-time indexes; and (c) that have simple specifications so that country-to-country quality differences are least likely to bias the results. Processing methods will be the same as for the full-scale survey; however, ways must be found to integrate the results with those of the full-scale survey.

52. The second method retains criteria (b) and (c) but uses the "regression method". Though it is less "natural" for sampling statisticians than the first method, it is hard to judge whether it will give more or less satisfactory results. The 150 detailed categories are aggregated into still larger summary categories, perhaps 10 to 20 for which expenditures will be requested from the countries. The sample of approximately 100 items to represent these summary categories is selected in the following way: from the results of the previous phase III bench-mark survey, in each summary category, a combination of items is sought whose PPPs best explain (in statistical meaning) the PPP of the category. The choice of the combination of items is made by applying a modification of a stepwise regression procedure ("leaps and bounds"). The application of this method makes it possible for items that are important for all countries to be deleted because the price ratios obtained for these items explain much too "poorly" the over-all PPP of the category. A first test "in the field" of the possibility and the facility of gathering the data by these two methods was conducted in Africa (Senegal and Tunisia) by EUROSTAT. The results were discussed at a meeting organized by the World Bank and agreement was reached on further procedures to be used in additional experiments in the Caribbean, Asia and Africa.

C. Short-cut method

53. This method will be used for countries which do not participate in either the full-scale or reduced-information survey. Basically, it consists of uncovering

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generally available physical or monetary economic indicators with which real GDP or the real values of its components are highly correlated. One estimating equation linking GDP (or its components) to these variables, based on the relationship that exists for the bench-mark countries, can be used to estimate GDP (or its components) for non-bench-mark countries.

54. Research along these lines is being conducted at the University of Pennsylvania, which will continue to carry the responsibility for this line of work.

55. Up to now, regression formulae have been obtained from the 1970 data for the 16 countries participating in phase II and from the 1975 data for the 34 countries participating in phase III. These formulae have been applied to more than 100 other countries. 15/

56. The preferred formulae that have been derived up to this point link the real *per capita* GDP to (a) the nominal (exchange rate converted) *per capita* GDP, (b) an indicator of the sensitivity of internal price movements in each country to world prices and (c) an indicator of the share of international trade in the activity of the country. Formulae have also been obtained for allocating total GDP to the main final expenditure components of GDP, that is, private and public consumption and investment.

57. The formulae obtained on the basis of 16 countries in 1970 and on the basis of 34 countries in 1975 are rather similar. The University of Pennsylvania expects to improve the methodology, especially by seeking better estimates of the coefficients and additional explanatory variables.

58. The United Nations Statistical Office intends to promote other research and analysis of both reduced-information and short-cut methods so that a widely recognized methodology may be established by the middle of 1984, though there will still be a question of whether the results of the application of the short-cut method should be published by the United Nations.

D. Regional and subregional comparisons

59. Research has begun on the problems of estimating regional and subregional results as well as those for individual countries.

60. The first difficulty, which the United Nations Statistical Office hopes will be temporary, is that not all the countries in the world and, in many cases, not all the countries of a geographical area which can be considered a region participate in ICP. At present, the sole "complete" regions are Latin America and

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15/ Irving B. Kravis, Alan Heston and Robert Summers, "Real GDP per capita for more than one hundred countries", *Economic Journal*, June 1978, and "International comparison of real product and its composition: 1950-77", *Review of Income and Wealth*, March 1980.

the European Community. A methodology is to be worked out before the end of phase IV for estimating the results for non-participating countries. Similarly, difficult methodological problems remain to be solved in making regional comparisons, although the phase III report will indicate significant progress towards this end.

61. The extremes in treating the regional problem are (a) to ignore it or (b) to build world-wide comparisons on the basis of regional comparisons. In extreme (a), which may be referred to as the "universal" approach, the plan for data gathering - the choice of specification etc. - would pay no heed to regional considerations. All countries would be treated alike, regardless of location, and a single aggregation would be applied to all. Estimates for regions could, of course, then be obtained by aggregating for the appropriate set of countries. The advantage of a universal approach is that it tends to protect the quality of comparisons between countries in different regions (for example, United Kingdom, Japan, United States of America etc.). In extreme (b), the "regional" approach, the starting point is a set of comparisons, each one involving the countries within a region. The regions are compared, using the same formulae as applied to the countries in the intraregional processing. The advantage of a "regional" approach is that it tends to protect the quality of the comparison between countries in the same region (for example, France-United Kingdom, Brazil-Argentina etc.).

62. In the regional approach, it is necessary to find ways of aggregating expenditures on GDP within regions and, also, to define an average regional price. These requirements are very closely linked to the formula used to aggregate PPPs for categories, and the conflicts described in paragraph 43 above are relevant.

63. The results of different treatments of the regional problem, including a compromise treatment, will be presented in the report on phase III. In the compromise method, which is the preferred one in the report, priority is given to regional comparisons in aggregating within detailed categories but priority is given to world-wide comparisons in aggregating the detailed categories to summary categories, major components of GDP and GDP itself (see para. 10).

64. Of course, the other aggregation formulae also make it possible to produce alternative treatments of the regional <u>versus</u> the universal approach. The regional comparisons and the aggregation formulae are two aspects of the same problem, which will be presented to the expert group proposed by the Commission.

E. Methods for updating the results

65. To update the results of the bench-mark years to subsequent years, the Statistical Office is considering two different methods, one of which has already been experimented with in ICP. The first one is to carry out a reduced-information survey in the participating countries. The other method is to use the time-to-time indexes drawn from each country's national accounts of constant and current price income series. 16/

16/ EUROSTAT is implementing a special method for European Community countries, using small annual surveys.

66. More need not be said about the first method. What is contemplated in the second one is the application of each country's time-to-time price indexes to the bench-mark year PPPs. This may be done at the level of GDP as a whole, at the summary category level or at the detailed category level. As a practical matter, the summary category level seems most feasible and ICP has developed an "updating worksheet" cast in these terms. The worksheet calls for annual expenditures at the summary category level both in constant and current prices, from which the implicit deflators can, of course, be obtained.

67. It should be noted that, in the actual application, problems arise in reconciliation between the results of two bench-mark years and the results obtained through extrapolations by time-to-time indexes. These difficulties, though not unexpected, have not been fully investigated. It is possible that investigation will indicate a need to have a longer list of items or more carefully chosen sample items. It is also possible that the method will be used for only a limited time.

68. Comparisons of various bench-mark estimates with extrapolated estimates (for example, in phases II and III of ICP, in 1968 and 1973 comparisons in Latin America and in 1970, 1973 and 1975 comparisons in the European Community) all indicate the seriousness of the problem.

69. In addition to the explanation of the differences given in paragraph 14 above, the following reasons are well known:

(a) The weights underlying time-to-time procedures are likely to be different from the national expenditure weights used in comparisons across space;

(b) The changes in nominal values of external trade balances are not only affected by the international movements of prices but also by variations in exchange rates; thus, for place-to-place comparisons, the deflator for the external trade balance cannot be taken as a combination of ratios of time-to-time price indexes alone, but adjustment has to be made to take into account the movements of exchange rates.

F. Manual for participating countries

70. A first draft of the part of the manual concerning the full-scale survey was completed in June 1980 and sent to all participating countries and a number of interested organizations and persons.

71. The draft will be revised in the light of the surveys carried out in 1979 and 1980 and the comments received. The definitive version of this part of the manual is scheduled to be available by the middle of 1981.

72. The ICP staff began work on the part of the manual concerning the reduced-information method; a first draft is expected to be available by mid-1981. It will be used to implement reduced-information surveys at the end of 1981. The definitive version of this part of the manual is scheduled to be available in 1982.

IV. TIME SCHEDULE FOR PHASE IV AND WAYS TO ACHIEVE IT

A. Regionalization

73. The methodological problems of regionalization have already been discussed above. Some progress has been made on the organizational aspects.

74. In Latin America, responsibility has been given to ECIEL for price collection and to ECLA for breaking down the expenditures; the transfer of full responsibility for future operations to ECLA is under way and is expected to be completed by the end of 1983. All countries affiliated with ECIEL participated in a full-scale survey in 1979. 17/ Some Caribbean countries participated in the regional comparison in 1980; others will participate in 1981.

75. In Europe, ECE has invited all countries to participate in a full-scale survey in 1980, co-ordinated by either Austria or EUROSTAT. Approximately 20 countries participated in the 1980 survey. The Economic Commission for Europe has held several informal meetings to plan the organization of field work as well as for methodological purposes.

76. In Africa, Asia and the Pacific, the assumption of responsibility by the regional commissions (Economic Commission for Africa (ECA), Economic Commission for Western Asia (ECWA) and Economic and Social Commission for Asia and the Pacific (ESCAP)), delayed for organizational reasons and lack of human resources, is expected to start in 1981. Most of the work on the full-scale survey, to be carried out in 1981 in Africa and Asia and the Pacific, will be co-ordinated by the United Nations Statistical Office or EUROSTAT. It is hoped that by 1984 most of the responsibility will have been assumed by the regional commissions.

77. In Africa, the United Nations Statistical Office has received strong support from EUROSTAT, which has agreed to co-ordinate ICP operations in seven French-speaking countries. The United Nations Statistical Office assumes co-ordination responsibilities for about five other countries. Several meetings, held separately or jointly for these two groups of countries, took place in 1980 and a general discussion of the work took place during the first session of the Joint Conference of African Planners, Statisticians and Demographers, which took place at Addis Ababa in March-April 1980.

78. In Western Asia, discussions are under way with ECWA with a view to ensuring its early participation.

79. In Asia and the Pacific, a meeting of participating countries, with observers from other countries in the region, is scheduled to be hosted by the Central Statistical Organization of India in October 1980. The assumption of responsibilities by ESCAP will be one of the main items on the agenda.

17/ The results of the intraregional comparisons will be available in the first quarter of 1981.

80. One of the difficulties in the participation of the regional commissions in ICP work is the question of financing an ad hoc consultant for at least two years in each region. This should be borne in mind when the problem of the ICP Trust Fund is examined (see paras. 91-94 below).

B. Organization of phase IV

81. One hundred and six countries have been directly or indirectly (through regional bodies) invited to participate in the full-scale survey. A list of the countries which have agreed to join phase IV will be made available to members of the Commission during the session.

82. Those countries which have not agreed to participate in the full-scale survey will be invited to join the reduced-information operation once the first draft of the manual on reduced information is available (see para. 72 above). Considering the limited data requirements and the reduced work burden, it is hoped that most countries not undertaking bench-mark surveys will agree to join the reduced-information operation.

83. As in the past, the United Nations Statistical Office will receive all the detailed and basic information concerning the participating countries. In particular, this will make it possible to test alternative aggregation methods, to improve the data requirements (for example, decrease in the number of items to price) and to undertake research on special subjects. Worksheets for data reporting for the participating countries have been redrawn. They differ from those used during the first three phases of ICP mostly in presentation and emphasis on the explanations linked to the questionnaires. Among the more important revisions are the reporting forms for health and education and the more extensive requests for the estimates of the distribution of expenditures within the detailed categories.

84. The reference dates for phase IV full-scale surveys are 1979 for the Latin American countries affiliated with ECIEL, 1980 for Europe and North America and 1981 for Africa and Asia. For various reasons, some countries in these regions are not following this schedule. The year 1980 will be taken as the common reference year for the presentation of the detailed results. The 1980 calculations will include the countries for which the reduced-information surveys will be carried out by the end of 1982. If everything works as planned, the information necessary for a set of world-wide comparisons should be available for processing in 1983.

85. The phase IV report will differ from the preceding ones in that no special studies will be included. On the other hand, it is intended to modify the presentation of the tables. In the first two reports and, to a lesser degree in the third, the United States of America was taken as the reference point for comparisons; in the fourth report, the accent will be on the contribution of each country to the world's GDP or to the real value of its components (global and per capita figures will be given). As indicated above, binary comparisons between countries will be given (as in the report on phase III). Special tables

distinguishing between commodities and services, and between traded and non-traded goods, will be published (as in the previous reports). Finally, the updating of the results will be done for the latest possible year (1982 is the target). If possible, at the end of 1984 or the beginning of 1985, updating to 1983 will be undertaken.

C. Expert group

86. At its twentieth session, the Statistical Commission "endorsed the establishment of an expert group financed from extrabudgetary resources to advise the United Nations Statistical Office on methodology". 18/ So far, there have been financial and administrative difficulties in establishing the group.

87. The Statistical Office proposes the following terms of reference: the expert group should (a) take note of the progress of the ICP work; (b) evaluate the importance of the various methodological problems to be solved; (c) discuss the problems on the basis of documentation prepared on a voluntary basis by interested persons; (d) make recommendations to the ICP staff on how to solve the methodological problems and (e) promote research on methodological or economic problems arising from the data gathered in the United Nations Statistical Office.

88. It should be emphasized that the outcome of the expert group meeting should be operational recommendations to the ICP staff on carrying out the work on the special topics examined.

89. Although the Statistical Office has given much thought to the composition of the expert group, so far no decision has been made. Moreover, the financing of sessions of the expert group will be difficult owing to the lack of adequate contributions to the Trust Fund (see paras. 91-94 below).

90. Despite the uncertainties, it is hoped that the first session of the expert group will take place at the end of 1980. The agenda will include the study of the comparison of special services (health, education) and government expenditures.

D. Trust Fund

91. The United Nations contribution to ICP through regular budgetary and extrabudgetary resources provides the salaries of seven staff members.

92. All other ICP expenses are financed through a special Trust Fund set up by the United Nations. The additional expenses should cover:

(a) The salary of at least one more staff member;

(b) The travel of staff members to attend regional meetings and to visit countries in order to help them implement the work and carry out the reduced-information surveys;

18/ *Official Records of the Economic and Social Council, 1979, Supplement No. 3* (E/1979/23), para. 77 (d).

(c) The financing of part or all of special ICP regional meetings;

(d) The financing of certain field operations in a few countries participating in ICP for the first time;

(e) The hiring of regional advisers in Africa, Asia and the Pacific to assist the participating countries and to help in the transfer of certain responsibilities to the regional commissions and

(f) The financing of expert group meetings (see paras. 86-90 above) and eventually the hiring of experts to study certain topics.

93. In 1978, the United Nations initiated efforts to obtain contributions from countries. To date, Austria, Belgium, Denmark, Japan, the Netherlands, Norway and the Commerzbank (Federal Republic of Germany) have contributed directly. France, Sweden, the United Kingdom and EUROSTAT have contributed technical assistance to participating countries, while the Inter-American Development Bank and ECIEL have contributed to work in Latin America. India has given strong support to the organization of a 1980 meeting for the countries of Asia and the Pacific.

94. A new and very strong effort was made at the end of 1979 to obtain contributions from additional countries and from foundations and multinationals, but the result so far has been inadequate. The Trust Fund does not stand at the required level to allow ICP to complete all its tasks. Help from the Governments represented on the Statistical Commission and from other States Members of the United Nations is required to obtain additional contributions to ensure the successful outcome of phase IV.

V. CONCLUDING REMARKS

95. At present, ICP has attained at least one of its aims, namely, to make countries and international bodies aware of the importance of the results it produces. This has been achieved by involving progressively more countries in the surveys and by encouraging discussions concerning the methods and results. Prior to the final transfer of ICP to the regular programme of the United Nations, more international co-operation is needed. In the first three phases of ICP, the methodology of the full-scale survey was established and a basis for research concerning other methods set up. It is hoped that the major outstanding methodological issues will be solved in the next two years. There is no doubt that the continued participation of the international community of statisticians and economists, as well as a special financial effort by many national and international institutions, are the sine qua non for the final success of ICP.

VI. POINTS FOR DISCUSSION

96. The Commission may wish to discuss:

(a) The organization of the work on a regular basis after 1984 (paras. 18-19);

(b) Whether the United Nations Statistical Office should be responsible for implementing the short-cut methods and publishing the results (para. 58);

(c) The need for regional comparisons (paras. 59-64);

(d) The need to update the results of bench-mark years to subsequent years (paras. 65-69);

(e) The transfer of responsibilities for co-ordination and regional processing to the regional commissions (paras. 74-79);

(f) The terms of reference of the expert group (para. 87);

(g) The need to ensure permanent and sufficient funding for ICP if it becomes a permanent operation of the United Nations (paras. 91-94) and

(h) The need to promote ICP and to involve as many countries as possible (para. 95).
